

S E W A G E .

*To the Chairman and Members of the late Local Board,
and the Owners and Ratepayers of*

S O U T H B O R O U G H , K E N T .

GENTLEMEN,—It having been represented to me that some misapprehension has been created by the remarks and statements of Mr. Henry Crundwell at the meeting of ratepayers held in the National Schoolroom on Tuesday, the 16th instant, as to the recommendations I have at various times made to the late Local Board upon the important question submitted to me, I beg to lay before you a plain statement of the facts of the case, founded, as far as practicable, on documentary evidence.

Early in March last year Mr. Knocker, a member of the late Board, requested me to inspect the outfall works at Southborough, and shortly after I wrote Mr. Knocker:—

19, Buckingham Street, Adelphi, London,
April 4th, 1874.

SOUTHBOROUGH, KENT.—SEWAGE OUTFALL.

DEAR SIR,—As you know, at your request, on the 12th of March ult., I cursorily inspected with you and the Chairman of the Local Board the works recently constructed at the outfall, or discharge end of the main drain, that, in connection with the

branch drains, convey the sewage of Southborough away from the dwellings, together with a portion of the rain that falls on the roofs of the various buildings and on the surface of the courts, yards, and roads of the district in which the drains are laid. I also inspected, while in operation, the works designed to deodorise, or render clear and innocuous, the water discharged at the outfall before it enters the brook or stream situated near to the outfall works.

At present the sewage, as it runs into the works, is received in some open reservoirs or tanks constructed for the purpose, where for about twelve hours (in the day) out of the twenty-four, as I am informed, and saw myself while I was at the works, a certain quantity of fresh-burned (quick) grey-stone chalk lime is rudely thrown into the reservoir or tank that first receives the sewage. The sewage, after receiving the lime, then passes through some coarse filtering material into and through other tanks, until, finally, after being thus treated, and depositing the coarser particles mixed with it, passes into the brook.

In the other twelve hours (of night), I am informed, no additional lime is put in the tanks; but after depositing the heavier substances brought down with the sewage, and after passing through the coarse filters, flows on into the adjoining river.

I understand you that the millers and some other parties having land along the river course complain that at present the water at times and seasons does not run into the river from the outfall works, in their opinion, sufficiently purified, or in such a state when mixed with the water in the brook, as to prevent the mixed waters emitting a somewhat disagreeable odour as they flow together down the stream past the water-mills below.

You ask me what, in my opinion, should be done to remedy this state of things?

1st. Whether the sewage, as it passes from the outfall works, should be used to irrigate land, or otherwise purified through earth?

2nd. Or, if not, what other means should be adopted to render the sewage innocuous as it passes into the river or stream.

Seeing that your Local Board have already, at great exertion, and at a considerable expenditure both of time and money, constructed works to purify the sewage by deposition, filtration, and

the use of lime, I am disposed to recommend you to perfect the works and system already in use.

It occurs to me the works would be improved—

(a). By adding an arrangement that would cause the sewage water, as it passes from the sewer into the first tank, to flow over a suitable tumbling weir, so that the quantity passing at any given time might be readily ascertained.

(b). By using upper chalk lime instead of grey lime ; by dissolving the lime in water, so as to form saturated lime water, or cream of lime, and discharging the lime water in proper quantity, so as to mix with the sewage as it flows from the sewer.

(c). By making suitable arrangements for causing the lime water to mingle with the sewage during the twelve hours of night, as well as during the twelve hours of day.

(d). By, if found to be necessary, perfecting the filtering arrangement and increasing the lime now allowed for the water to deposit before it is discharged into the stream.

(e). By using, in addition to the lime, other deodorisers.

(f). It might also be found desirable, during or after heavy rains or storms, to arrange for the water to flow direct to the river after having simply deposited the heaviest particles.

I should expect, at least for some time to come, the sewage water could be purified sufficiently by the above means, so as to become innocuous when passed into the river.

(a). A weir would enable the quantity of sewage in dry and in wet seasons to be ascertained, and this is very desirable.

(b). Grey lime contains clay, is semi-hydraulic, that is, sets more or less quickly in water. Chalk lime contains no clay, and will not set in water. Saturated lime water would mix more quickly and effectually with the sewage matter to be acted upon by the lime than with undissolved lime.

(c). Lime water could be more readily discharged at night,

as well as in the day, or on Saturdays, without the aid of an attendant.

(d). It seems to me this might be accomplished without much outlay.

(e). Some other chemicals besides lime are sometimes used, especially in hot, dry weather, to mix with the outfall water from sewers. A chemist would, if necessary, advise as to this.

(f). I do not know what amount of surface water from roofs, yards, and roads, now flow into the sewers; but if the quantity should be considerable, no doubt, in heavy rains, a portion, as is the usual custom, might, after slight deposition of heavier particles, be allowed to run direct to the brook without creating any nuisance.

I remain, yours truly,

(Signed)

S. C. HOMERSHAM.

E. N. Knocker, Esq.,
Member of Local Board,
Southboro', Kent.

In accordance with one of the before-named recommendations, the Board had a weir erected for the purpose of enabling the quantity of water from the sewer to be at any time measured, and in June following I received from Mr. Delves, Law Clerk, a letter dated the 18th, forwarding me copy of resolution passed by the late Board "that I be requested to attend and inspect the present system of sewage adopted by the Board, and advise them as to its more efficient working or otherwise."

In consequence, on the 28th of July, I reported to the Board as follows:—

19, Buckingham-street, Adelphi, London,
July 28th, 1874.

*To the Chairman and Members of the Local Board,
Southborough, Kent.*

GENTLEMEN,—In accordance with the resolution forwarded in your clerk's (Mr. Delves) letter to me of the 18th of June,

on Saturday last, in company with several members of your Board, and with Mr. Wright, your engineer, I inspected the outfall works, the stream and mill dams of the two mills immediately below the outfall works, and the plots of land situated nearly due west of the outfall, considered to be favourably situated as to level for being irrigated by the sewage from the outfall.

I also went over the course of the principal line of sewers, and gathered much valuable information concerning the matter in question from the members of the Board, as well as from Mr. Wright.

Having previously, namely on the 12th of March last, in company with your Chairman, and in company with Mr. Knocker, cursorily inspected the outfall works, I was pretty well prepared on Saturday to examine into the points that specially bore on the object of my visit.

The district under the jurisdiction of your Board was given to me as about three square miles in area; the population dwelling in the district as numbering about 3,100 (three thousand one hundred) souls, occupying about 510 (five hundred and ten) houses and cottages. It was stated that 450 (four hundred and fifty) houses and cottages have connections with the sewers, and that about one-half this number have cisterns connected with their closets, and the other half keep the soil-pans as clean as they can by throwing down them the slops and other liquid, or water, by means of pails.

I was also informed that most of the down pipes in connection with the gutters of the roofs are connected with the drains, and that four or more gullies in the roads convey the rain water flowing from the surface into the drains.

As most, if not all, of these figures were given to me as approximate only, I have been careful to mention the numbers, in order, if necessary, that they may hereafter be corrected.

The least amount of water that flowed down the sewers in hot, dry weather was stated to be represented by one-fourth of an inch of water running over a notch-board, or weir, 12 inches wide. This is equal to rather less than four gallons per minute. The greatest depth of water in dry weather running over the notch-board, or weir, was represented to be one inch: this is equal to about 32 (thirty-two) gallons per minute.

I could not obtain any reliable information, in dry weather, as to the length of time during the 24 hours that the varying depths of water run over the weir.

It would be well, in dry weather, to have the depths taken once

every hour during the 24 hours, and for a week (seven days) the depth running over the weir for every hour, from six in the morning till ten o'clock at night. If this were done, the quantity of sewage in dry weather discharged at the outfall could be pretty accurately arrived at.

In moderate rains the depth running over the weir was given me at three and three-quarter inches; this is equal to about 232 (two hundred and thirty-two) gallons per minute.

In very heavy rains, or storms, all the water from the sewers does not go into the outfall tanks; a portion flows into a rude reservoir excavated in the ground. When this is filled, the overflow goes directly into the brook, the heavier particles brought down by the flood being deposited in the reservoir.

It thus appears that in very dry weather the least run at the outfall is four gallons per minute; the greatest run thirty-two gallons per minute. That in moderate rains the run is 232 (two hundred and thirty-two) gallons per minute, and in very heavy rains, of course, a much greater quantity, not yet defined.

It is desirable that the very irregular quantities discharged at different times should, as far as practicable, be regulated, so as to cause a greater flow or discharge at the minimum, and a lesser flow at the maximum.

The minimum flow could be increased by fixing to every closet a cistern supplied with water, with proper discharging apparatus providing a supply of water, and encouraging the proper use of the same.

The maximum flow could be diminished by not allowing surface water from roads or yards, &c., to be discharged into the sewers.

The shutting out this water, at least, as far as practicable, would not only diminish the maximum flow, but would keep out the washings from the surface of the roads, which consist of a description of mud and sand very difficult to be dealt with at the outfall works.

I should not recommend, at present at least, that the down pipes that convey the water from the roofs to the sewers be disconnected. Such water is always moderately clear, brings down little or no solid matter into the sewers, and only in exceptional heavy rains would be disadvantageous; while in ordinary rains the water from this source scours the sewers, and thus tends to keep them clean.

Provided in this manner the maximum discharge in a given time at the outfall be diminished, and the minimum flow increased, the dealing with, or the deodorising the water at the outfall, whether the object be effected by chemical means and deposition, or whether it be effected by irrigation, or whether it be effected by a combination of both these methods, would be greatly facilitated.

On this subject, refer to the letter I wrote Mr. Knocker on the 4th April, which please read with this.

I should advise, as you have already constructed works at the outfall to purify the sewage by the addition of chemical deodorisers, deposition, and filtration, that you endeavour to perfect the system now in use; and, as before, I should recommend you to use, in addition to the lime, other kinds of chemical deodorisers. A chemist could best advise you what description of deodorisers to use, and how to use them.

Mr. Dugald Campbell, the eminent analytical chemist, of 7, Quality-court, Chancery-lane, who has had much experience in the use of chemicals to deodorise sewage, happened to call here yesterday. On conferring with him I found he quite coincided with the views I have herein expressed.

I have the honour to be, Gentlemen,

Your very obedient servant,

(Signed) SAMUEL COLLETT HOMERSHAM.

After the receipt of the foregoing, namely, on the 11th of October, in accordance with a previous appointment, the Chairman and the late Board's Surveyor met me here. After a long conference, the particulars of which would answer no present purpose, and would be improper for me now to enter into, it was settled that I should put myself in communication with Mr. Dugald Campbell, and advise some additional means of purifying the effluent water before it entered into the brook.

Subsequently I had several conferences with the Chairman of the late Board and with Mr. Campbell, and, after careful consideration, advised the Board as follows :—

19, Buckingham-street, Adelphi, London,
Dec. 17th, 1874.

*To the Chairman and Members of the Local Board,
Southborough, Kent.*

OUTFALL SEWAGE WORKS.

GENTLEMEN,—Referring to my two Reports dated respectively April 4th and July 28th, and my subsequent conferences with

your Chairman; Mr. Chittenden, one of the members of your Board; Mr. Dugald Campbell, the analytical chemist; and your Surveyor, in respect of the above, I now beg further to report to you as follows:—

In the above-named Reports I recommended you to adhere to the processes you have always had in use for the purpose of rendering the sewage water innocuous, namely: first, to mix a proper proportion of saturated lime water with the sewage water—neither too much, which unduly hastens decomposition, nor too little, which retards the precipitation of the sewage matters, the exact adjustment being made by the use of a chemical test known as the silver test.

Secondly, allow the water, after being thus treated, to remain a suitable time in the tanks or reservoirs you have had constructed for the purpose, in order to let the heavier matters fall to the bottom before the effluent water leaves the tank and mingles with the stream.

This method of treating sewage water, if properly carried out, renders the water clear and apparently innocuous, as may be noticed by anyone examining the water flowing from your tanks into the stream; this view appears also to be fully supported by inspections of samples of effluent water collected at other times and submitted to me.

With the view, however, to the further improvement of such water after it has been treated with lime or other chemicals, should this last be found advisable, and before it is allowed to pass into the stream, the effluent water should be brought in contact with soil and clay; and, in order to improve the water to the utmost, I would suggest to you that your present tank, instead of being divided into six compartments holding collectively 56,000 (fifty-six thousand) gallons, namely:

Five compartments, capable of holding 7,000 (seven thousand) gallons each, the other compartment 21,000 (twenty-one thousand) gallons, should be divided into four equal-sized compartments, each compartment holding about 14,000 (fourteen thousand) gallons, and made quite water-tight. Let the compartments be numbered respectively 1, 2, 3, 4.

In using the tank, let No. 1 compartment have a given quantity of lime water run into it; afterwards cause the water from the sewer to run in until it is filled; let No. 2 compartment, after having the lime water run in, commence to be filled; by the time the second compartment is thus filled the water in the first com-

partment, except a small portion very near the bottom, mixed with the sludge or precipitated matter, should be allowed to flow to the adjacent land, as hereinafter explained; and No. 3 compartment, the lime water being first run in, should commence to be filled; during the time this was being filled, the water in No. 2 compartment to be conveyed to the land, and No. 1 compartment again filled as before.

Thus three compartments would alternately be filled with sewage water mixed with lime, and, after standing a time, nearly emptied. No. 4 compartment would be ready, when necessary, to enable one of the other three compartments to have the deposited matter cleaned out without stopping the process.

In order to render the water discharged from the tanks as pure as possible, before finding its way into the adjacent stream, I propose the water should be conveyed by means of a suitable culvert or covered aqueduct to land, about four acres in area, situated close to your reservoirs, west of the adjoining stream. The water to flow by gravity through a culvert at as high a level as practicable along the land, as shown on the accompanying plan, marked "Southborough Outfall Sewage Works and Land proposed to be used in connection with same, tinted brown." The land tinted brown would have to be purchased by the Board, and, as already explained, the water would flow along the higher edge of the same, through a suitable culvert, to be carried in the position of the dotted lines in red.

The water conveyed through this culvert to be discharged, not upon the surface of the land, but just below the surface, the land having been first specially prepared to receive it.

In order thus to allow the water to soak through the land, suitable connections would have to be made in connection with the culvert; the top stratum of the land to an average depth of four or five feet in thickness would have to be dug and broken up, so as to allow the water to soak into the upper stratum of the land, and filtrate through, and come in close contact with the soil and clay, before gravitating or draining through the sub-soil into the stream.

The land proposed to be so prepared is conveniently situated close to your present works. The gradual slope of the surface from the higher land, where the culvert is to be constructed, towards the stream that bounds it on the east, is well adapted for the purpose, as the water from the culvert can more readily be conducted about, and percolate through sloping land than it could through land that was level. Again, the lower portion of the land, being bounded by a stream, also renders it easy and cheap to get the

water away after it has passed through the land, while the land itself, covered as it is with a moderate thickness of soil lying on Wadhurst clay, is well adapted to purify the water in the most efficient manner.

I propose the surface of the land tinted brown on the plan should be formed into flattish corrugations. The courses of the corrugations are intended to be formed at about right angles with the stream, or with the line of the main culvert, to be carried along the upper ground.

At the crest of the corrugations small culverts would communicate with the main culvert, and convey and discharge the sewage water just below the surface of the prepared land.

Suitable deep drains, with drain pipes at the bottoms, laid in the ground at the depressions between the crests, would conduct the water, after it has percolated through the soil and prepared upper stratum of land, into the stream.

It is intended to arrange the connections between the main culvert and the subsidiary drains so that at pleasure the whole or only a portion, say a third or two-thirds of the land, could have water passed through it at one and the same time. By this arrangement for any given time a third of the land could be supplied with sewage water; at other times another third of the land could be so supplied, and at other times the remaining third, and so on at pleasure. I have proposed that the tank should be divided into four water-tight compartments, because, by alternately emptying, or nearly emptying, each compartment of the water down to just above the sludge or deposited matter, the whole quantity of lime water required could be let into the compartment, when so emptied, before it was again commenced to be filled. The admitting at once the full dose of lime water to be used for one reservoir on to the sludge or deposit would be attended, as I know from long experience in the use of lime water, with the three following advantages:—

First,—The sludge and deposited sewage matters would be saturated with caustic lime for a short time, which would tend to prevent the formation of, or to kill, if formed, any organisms, animal or vegetable, contained in the sewage.

Secondly,—By putting in all the lime water at the bottom of the emptied compartment, the sewage water, when admitted, would be slightly caustic up to near the time the reservoir

was filled, and this would cause the sewage matter to deposit more quickly.

Thirdly,—The whole of the sewage water, or nearly the whole admitted into the compartment, would be *sure* to run out when the compartment was emptied. This is more important than at first sight appears, because when the whole of the sewage water is not delivered upon the land within a short period of leaving the sewer, the urea and organic matter contained in the water is apt to putrify, especially in warm summer weather, and a small portion of such putrefying matter, when mixed with fresh sewage water, acts as a ferment, like yeast, and sets other water added to it to putrefy quicker than it would otherwise do.

Should you, however, find any great practical difficulty or expense in making these separate compartments, you could let the water continue to flow in at one end and flow out at the other, or otherwise modify what I propose, although, for the reasons I have given, I consider the results would not be so satisfactory as with water-tight compartments alternately filled and emptied.

No further details have now been described than I consider necessary to make intelligible the general plan proposed to be adopted. Should I have succeeded in conveying clearly to you what I propose, and should you approve the plan, I see no difficulty in giving you particulars for the construction of the necessary works.

There can be no doubt, if the sewage water from the outfall as hereinbefore proposed is allowed (after being properly treated with lime, or, if found useful, other suitable chemicals) a short time to deposit, and is then conveyed through the land, that the water will percolate into the stream in the purest state it is capable of attaining in a reasonable length of time, and will be in a fit state to meet every requirement of the law.

I am, Gentlemen,

Your obedient Servant,

(Signed) SAMUEL COLLETT HOMERSHAM.

After the receipt of the foregoing, the Board instructed their Surveyor (Mr. Thompson) to make a plan and estimate showing the plot of land, with the position of the culvert and drains on

same as described in my report. I received these plans and estimates early in January, and afterwards advised the Board as follows:—

19, Buckingham-street, Adelphi, London,
January 26th, 1875.

*The Chairman and Members of the Local Board,
Southborough, Kent.*

OUTFALL SEWAGE WORKS.

GENTLEMEN,—I have looked through and examined the estimate and the plan received from Mr. Thompson on the 9th instant, in respect of the above.

The priced details by which the amount of the estimate £600 (six hundred pounds) is not given, and this estimate (£600) is stated to be made exclusive of the cost of any alteration to the present tanks.

Again the plan is unaccompanied by a sufficient number of sections or levels of the surface of the land to enable the suggested works to be properly laid down.

In order even to get at an approximate estimate of the cost of the suggested works, it would first be necessary to have sections taken through the land distant about twenty-five feet apart.

I would therefore suggest that Mr. Thompson should put these sections in hand at once, and if you agree to this I will send Mr. Thompson necessary instructions for making the plans and sections.

Should you determine to apply to the Local Government Board for their sanction to the borrowing a further sum of money to purchase the necessary land to carry out the works as suggested, I should suppose a general description in words of the proposed works, accompanied by a plan of the land to be taken, would be sufficient, and that this application need not be delayed till the detailed particulars of the proposed works are got out.

I am, Gentlemen,

Your obedient Servant,

(Signed)

SAMUEL COLLETT HOMERSHAM.

The Board having got involved in legal proceedings, it was considered expedient, if not absolutely necessary, to use some addi-

tional means for purifying the water passing from the tanks before it was allowed to mingle with the stream.

Under these circumstances I had no hesitation in advising the Board that the best plan, if not the only plan that would effect the object, was to pass the water through soil and land before it was allowed to join the stream. The plot of land close adjoining the works before alluded to, is every way suitable for the purpose. Dr. Frankland, the eminent chemist, a member of the late Royal Commission on the Pollution of Rivers, has long since shown, and again publicly stated at a meeting of the Chemical Section of the Society of Arts, as recently as the 12th inst :—

“That two processes for the treatment of sewage irrigation and intermittent filtration were not difficult of application in any locality, and if land was easily obtainable, by adopting the former, it might be possible to pay the expense. If, however, the locality were one where land was costly, intermittent filtration should be resorted to, because, whereas for irrigation it required one acre of land for one hundred people, with intermittent filtration an acre would suffice for three thousand.”

The population of your district at present being three thousand one hundred, there can be no doubt, by securing the four acres of land close to the works, as proposed, that there would be ample land to provide not only for the present population, but for a large increase in the same.

Having submitted to your judgment, in a consecutive form, the Reports I have at various times made to the late Board, I leave you to decide whether Mr. Crundwell has just grounds for the statement he is reported, in the *Kent and Sussex Courier*, to have made :—

“That I had, in each of my Reports, recommended that the lime should be applied to the sewage in a different manner; at one time in the tanks, at another time in the sewers, while at one time I said they used too much lime, and at another too little, and on a third occasion the use of other chemicals and silver test.”

If, then, Mr. Crundwell has thus misrepresented (though it may

only have been by inadvertence) what I have reported to the Board in writing, I ask you what confidence you can put in Mr. Crundwell's ability to remember or represent accurately what I stated in conversation some time since, when I examined the sewage works in company, not with himself alone, but with several other members of the Board.

Referring again to the Report of Mr. Crundwell's speech as reported in the *Kent and Sussex Courier*, I need now hardly seriously notice Mr. Crundwell's statement, "that there would be an enormous pressure of water on the perforated pipes;" that "there would be an immense quantity of effluent water which would have to pass through the pipes;" that "I suggested the pipes should be put as far under the ground as possible;" that "I suggested that it would be better if they took the soil up to the tank and mixed it there with the sewage," &c. Either Mr. Crundwell must have misunderstood what I did say, or else Mr. Crundwell has not got the knack of explaining what he means to say. The subject is of too serious an importance to the inhabitants and ratepayers of Southborough to be dealt with so lightly and inaccurately as Mr. Crundwell has done.

If Mr. Crundwell considers the plan proposed to be adopted by the late Board is not a proper one, why does he not lay fully before the ratepayers the details of a more perfect plan? This he has as yet failed to do.

I unhesitatingly submit to you—

1st. To deal with the sewage water in the precipitating tanks you have already, at considerable cost, erected for the purpose.

2nd. To let the effluent water from the tanks flow through the land, properly prepared for the purpose, that immediately adjoins your works before it is returned to the brook.

By so doing you will have the whole of your outfall works

together on one spot, which will save great cost in management and labour. The more solid matter deposited in the bottom of the tanks, when taken out, can be sufficiently dried in suitable pits to enable it to be cheaply conveyed to and used as manure in conjunction with the water on the adjacent land.

The union of the two systems—precipitation and irrigation—on the intermittent system, as proposed, offers numerous advantages; for, as stated by Mr. Thorp, F.C.S. (who conducted the laboratory work for the late Royal Commission on the Pollution of Rivers), in a paper read before the Society of Arts on the 12th instant, although

“A sewage farm, where land can be obtained at a sufficiently low rent, may be made remunerative, yet I am of opinion that perhaps the best way of all would be a union of the two systems.

“A sewage farm does not always require sewage, and if it were arranged with intermittent filtering-beds attached, where the sewage could be purified when not wanted for agricultural purposes, I think the efficiency of the whole would be much increased. This arrangement would also dispose, to a great extent, of the excess of sewage in wet weather, when it could be passed through the intermittent filter, and the organic matter thus destroyed.

“I believe, however, that the notion that sewage is a valuable property must be to a great extent abandoned, and that towns must be content in many cases to pay for getting rid of the nuisance. The importance of this question, perhaps, cannot be overrated. A great deal has been said about waste and loss of valuable material, but in most cases the important consideration is to get rid of the refuse on the cheapest, most expeditious, and least dangerous principle.”

In your case, to attempt to purchase thirty acres of land—the least quantity required even for present use—to be converted into a sewage farm, at an undefined and certain heavy outlay; to construct an aqueduct half-a-mile in length, which in its course must cross a valley to conduct the water to the land; and by so doing subjecting yourselves to have to defend a suit at law for depriving two ancient mills of the water that at present flows to them, could not, in my opinion, I may take the liberty of remarking, fail to be

otherwise than most injurious to the true interest of South-borough. This, however, it is your province, and not mine, to decide.

I have the honour to be, Gentlemen,

Your most obedient Servant,

S. C. HOMERSHAM.



